

# Light and Lighting

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of the  
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Engineering  
Society

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## What Can You Do To Help?

I.E.S. members will be receiving, in the current issue of the I.E.S. Transactions, a circular inviting them to put on record their desire and ability to help the Society —by giving talks and lectures, by undertaking secretarial work, or in any other ways that may occur to them.

It is, in short, a preliminary effort by the Council to prepare an Array of Talent. We hope there will be a generous response.

We have always been convinced that the way to win the adherence and affection of members is to give them work to do, so that they may feel that they are in truth active elements in their Society, contributing directly to its success and prosperity.

And we have always felt, too, that there might quite likely be great and unknown sources of talent on which to draw.



### ***Education in Illuminating Engineering***

It has been evident for some time, partly owing to the entry into the lighting industry of young men recently returned from the Forces, that there is now a demand for classes in illuminating engineering. The I.E.S. Council has responded to this demand by arranging for two such courses to take place in London during the period September, 1947 to May, 1948. One of these courses is to be held at the Northampton Polytechnic on Wednesday afternoons and evenings; the other at the Borough Polytechnic on Thursday afternoons and evenings. The cost of each course will be of the order of £1 to £2 per candidate.

It will be observed that these are considerably shorter than the normal full-time courses hitherto organised. Many employers will, therefore, doubtless be willing to release candidates on their staff for one afternoon a week and the candidates themselves will probably be willing to give up one evening a week of their free time.

The courses will prepare candidates

for the City and Guilds of London intermediate examination in illuminating engineering. The value of this examination—the passing of which is one of the essential qualifications for those desiring to be placed on the I.E.S. Register of Lighting Engineers—is becoming increasingly recognised, and we understand that in the present year there was a record entry.

A notice drawing attention to these courses has been circulated to I.E.S. sustaining members and to some other firms in the lighting industry likely to be interested, though naturally the list is not exhaustive. We are asked to say, therefore, that any firm desiring to enter members of their staff, and any young men (I.E.S. members or otherwise) wishing to join up, are invited to apply to the secretary of the Illuminating Engineering Society, at 32, Victoria-street, London, S.W.1, who will put them in touch with the educational authorities concerned. It is desirable, however, that all applicants should state clearly which of these two courses—i.e., on the Wednesdays or Thursdays—they prefer.

The arrangements so far concluded

relate to London only. It is believed, however, that there may be a number of I.E.S. members and others interested in courses in other cities. The various I.E.S. centres will no doubt bear this in mind.

### ***I.E.S. Programmes of Papers***

During recent months special efforts have been made by the I.E.S. Papers Committee to get well forward with the arrangements for sessional meetings for 1947-48. We understand that already the programme is practically complete—certainly a great improvement on achievements for previous years. In addition to the regular sessional meetings there is also a prospect of some informal discussions and visits of interest. The various centres have also speeded up their procedure so that the complete programme should be available in good time before the opening of the next session in October.

The Papers Committee, however, has not stopped at this point, but is already considering items for the 1948-49 programme. We are asked to remind members that offers of papers for that session will be very welcome—and the earlier the committee can receive such offers the better the prospect of including them in the list of events.

### ***Illuminating Engineering in Australia***

Amongst those who were present at the I.E.S. annual dinner on May 14 was Mr. William Gunn, a welcome visitor from Australia, who was able to give good tidings of the Australian I.E.S.—we use the singular because the various constituent societies in

New South Wales, South Australia, and Victoria are now welded firmly together under a National Council. All are very active, and there is also, we gather, an affiliated organisation in Tasmania which pursues a more independent existence. As yet, we understand, there is no formally constituted I.E.S. in New Zealand, though there are a number of engineers and others keenly interested in illumination. It was interesting to learn how closely the developments in Australia run parallel to those here; the society has problems very similar to our own which it is solving in much the same way. In one respect things seem a little easier—as one might expect in a younger community contact with government departments is rather more readily established, and the I.E.S. in Australia has evidently a firm footing in this respect.

### ***Obituary***

#### **SIR FREDERICK CHARLES COOK**

We record with great regret the death of Sir Frederick Charles Cook, C.B., D.S.O., M.C., M.Inst.C.E., who was recently associated with Howard Humphreys and Sons, but had previously been chief engineer to the Ministry of Transport. He acted as chairman of the Departmental Committee on Street Lighting, whose reports issued shortly before the outbreak of war excited so much interest, and also as chairman of the Committee on Road Traffic Signs, for which the I.E.S. carried out a series of useful investigations. During the period of the war I.E.S. members also came in contact with Sir Frederick in connection with proposals for war-time street lighting. He was always responsive to offers of service and lent a ready and sympathetic ear to constructive suggestions.

### ***Impressions of Lighting in America***

There are, or will be shortly, quite a number of I.E.S. members on visits to the U.S.A. In our last issue we referred to the visit of Mr. L. G. Applebee. Mr. W. R. Stevens has been there for some little time. We have also received a welcome letter from Mr. R. Gillespie Williams who, we imagine, is likely to be engaged in his special work in America for some time to come, and who asks to be remembered to friends in this country. In a further issue we should like to refer more fully to his impressions of American lighting methods. Most striking, apparently, is the widespread use of fluorescent lighting which has developed on lines scarcely explored in this country as yet and which offers great future possibilities. Other points of interest are the general use of table and floor lamps in modern houses and apartments, which are seldom lighted from centre ceiling fittings, and the very high lighting loads customary for many lighting installations—far exceeding anything likely to be contemplated in this country for some time to come.

### ***Centre "News Letters"***

Our reference to the excellent news letter circulated periodically by Mr. W. J. P. Watson, the hon. secretary of the Birmingham Centre, has brought us a note from Mr. E. Smith, who reminds us that he, too, has followed the same procedure with the Leeds Centre, though apparently on somewhat less ambitious lines. No doubt there are other centres who have their own methods of keeping members in touch with what is going on. This is just the kind of item that

deserves consideration by a "Conference of Secretaries," as suggested in our last issue, and we are very glad to hear that the Areas Joint Committee proposes in future to provide for something of this nature.

### ***Lighting in Industry***

A very useful memorandum, under the above title, has recently been prepared by the Lighting Service Bureau (2, Savoy-hill, London, W.C.2). It is based on a report submitted to the various Working Parties set up by the President of the Board of Trade, and sets out in simple language just what those in industry need to know about lighting.

The memorandum, like the report, contains three main sections, dealing respectively with Principles of Good Lighting, Present Factory Lighting Standards and Practice, and Lighting Recommendations, and there are appendices dealing with the explanation of technical terms, lamps, and lighting costs and colour in industry. The suggestions in regard to colour will be read with special interest. At the end is a bibliography listing various publications available from H.M. Stationery Office, The Illuminating Engineering Society, the British Colour Council, and the Lighting Service Bureau.

### ***Award to Dr. M. Luckiesh***

The Illuminating Engineering Society (U.S.A.) has awarded the I.E.S. Gold Medal, given annually for "meritorious achievement which has conspicuously furthered the profession and art and knowledge of illuminating engineering" to Dr. M. Luckiesh, director of the Lighting Research Laboratory of the General Electric Co. (U.S.A.).

## I.E.S. Annual Meeting

The report of the I.E.S. Council for 1946, presented at the annual meeting of the Society on May 13, covers a memorable period. The main feature of the year was the holding of the convention in London in May, 1946, which was, by general consent, a great success. Linked with this event was the presentation, on his retirement from the position of hon. secretary, to Mr. J. S. Dow, who became president for the present session.

In every respect the Society has continued to flourish. Its membership now exceeds 2,000 and its income for the year from subscriptions topped £5,000—a figure which might have seemed fantastic only a few years ago. This has enabled the Society to strengthen its machinery at headquarters and to extend its activities. Another record has been broken in the number of meetings held during the year (over 130). This increase is due mainly to the activities of the various centres, which go from strength to strength. It will be noted that another of the I.E.S. groups—that associated with Cheltenham and Gloucester—was granted centre status last year, and that two new groups, at Stoke-on-Trent and Exeter, have recently been formed.

It is encouraging to note that several successful joint meetings have been held with other organisations such as the R.I.B.A., the Electrical Association for Women, and other local electrical and engineering societies, the good attendances at which are an indication of the growing interest in the work of the Society.

The list of officers for the next session makes interesting reading. It is as follows:—

**President:** Dr. J. W. T. Walsh.

**Vice-Presidents:** Mr. J. M. Waldram,

Mr. J. S. Preston, and Dr. E. C. Walton.

**Hon. Treasurer:** Mr. J. G. Holmes.

**Hon. Secretary:** Mr. H. C. Weston.

**Hon. Editor:** Dr. S. English.

Dr. Walsh, the president-elect, is chairman of the National Illumination Committee of Great Britain and is a principal scientific officer in the Light Division of the National Physical Laboratory. He is well known to lighting engineers throughout the world as the author of several works on illumination and photometry, which, though published over 20 years ago, are still regarded as standard works on the subject.

His election sets a new precedent, for this is the first time that any member of the Society has *twice* been elected to the presidential chair.

The Society is fortunate in having again the help of Mr. Weston as hon. secretary and of Dr. S. English as hon. editor—both posts involving a considerable amount of hard work. It may be recalled that Mr. Weston's acceptance of office followed immediately after the termination of his period as president—one wonders if there is another case on record of the president and hon. secretary of a scientific society thus exchanging positions.

An announcement of importance was that relating to the proposed Register of Lighting Engineers. It will be recalled that under this scheme the names of those I.E.S. members who fulfill certain conditions may be included in a register, entitling them to the exclusive use of the description "Registered Lighting Engineer (I.E.S.)." The postal ballot on this proposal revealed a large majority in favour, so that, in taking this somewhat bold step, the council is evidently carrying out the wishes of members as a whole.

## International Relations in Illuminating Engineering

(Summary of an Address delivered by Dr. N. A. Halbertsma, President of the International Illumination Commission, at the meeting of the Illuminating Engineering Society held in London on May 13th.)

There was an enthusiastic audience present to hear Dr. Halbertsma's address on the above subject, which was delivered in his inimicable manner, dwelling with insight on the somewhat complex machinery of the I.C.I., but relieved by many human touches, illustrating incidents that occur when delegates from many different nations assemble together.

Dr. Halbertsma began by recalling the efforts of the International Congress of Electricians in Geneva in 1896, which first established a system of photometric units, worked out by Blondel, and the work of the International Gas Congress leading to the International Photometric Commission, which held meetings in Zurich in 1903, 1907, and 1911.

In the meantime, the formation of Illuminating Engineering Societies in America (1906), in Great Britain (1909), and in Germany (1912) had helped to reveal the broad scope of the problems requiring international study. Accordingly in 1913 the International Photometric Commission was reconstituted on a broader basis and became the International Commission on Illumination (I.C.I.), for which Sir Clifford Paterson assumed the duties of honorary secretary.

The early activities of the commission were, however, frustrated by the outbreak of war, and it was not until 1921 that the I.C.I. held its first technical meeting in Paris. Subsequently, in Geneva (1924) and at Bellagio (1927) good progress was made, and at the gathering at Saranac Inn (U.S.A.) in 1928 the constitution of the commission was redrafted in its present form.

Dr. Halbertsma illustrated, by the aid of diagrams, the gradual expansion of



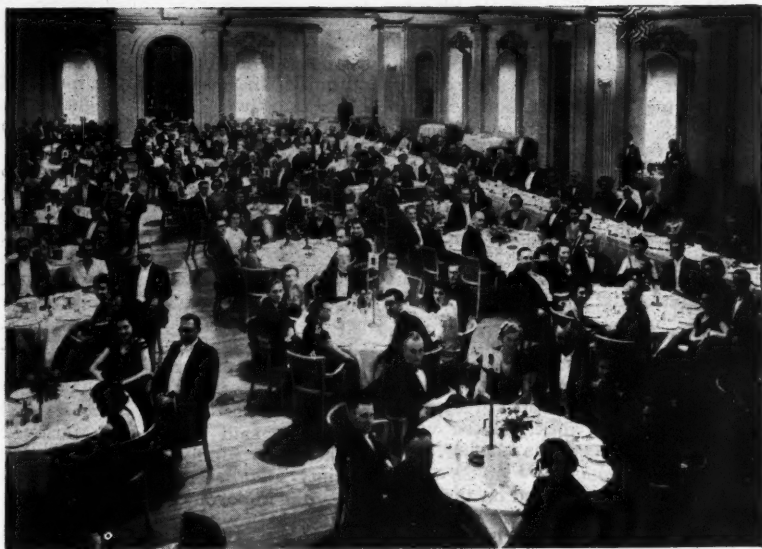
A historic group, taken at Bellagio (1927). In the centre is Dr. Halbertsma, on the left Dr. J. Teichmüller of Karlsruhe, and on the right Mr. Leon Gaster, the founder of the I.E.S. in Great Britain.

the work of the I.C.I., the growth in the number of new delegates as more countries came to be represented, and the organisation of national secretariats which undertook the task of collecting information on specific subjects and thus lighted considerably the work of headquarters. The climax of operations of I.C.I. was reached at the very successful tenth session held in Scheveningen (Holland) in 1939—though a few months afterwards the outbreak of the second world war checked all progress. Of the published accounts of the proceedings Vol. I was published in 1942 and Vol. II in 1943. It appears that there is a considerable stock of these volumes printed and in stock in Vienna and efforts are being made to acquire these. The material for Vol. III was hidden in vaults near Arnhem, and the main part escaped destruction and should soon be in England.

Now the work of the I.C.I. is being resumed and the broken threads of contact are in process of being mended once more. In the near future there will take place in Paris the eleventh session, originally planned to take place in France in 1942.\*

At the conclusion of the address Sir Clifford Paterson and Mr. P. Good were responsible for proposing and seconding a vote of thanks to Dr. Halbertsma for his delightful address, which was carried by acclamation.

\* It is now understood that this meeting will take place in Paris in September, 1948.



A general view taken at the I.E.S. Annual Dinner, held at Grosvenor House, London, on May 14th, 1947.

## I.E.S. Annual Dinner

The I.E.S. annual dinner, held at Grosvenor House (London, W.), on May 14, was, by general consent, an enjoyable and successful event. Although, it will be recalled, a dinner-dance was arranged in connection with the Convention last year, the event on May 14 was the first revival of what was always an annual item before the war. The holding of this dinner-dance the day after the annual meeting was, however, a new departure. This course seems likely to be adhered to in coming years. It was also the first occasion on which the dinner had taken place at Grosvenor House, where the general arrangements were good—notably those providing for the somewhat spectacular entry of the President, summoned by the Toastmaster from behind a curtain, to

descend the stairs into the dining room after all others were seated.

### "The Illuminating Engineering Society"

The toast of the Illuminating Engineering Society was proposed by the RT. HON. LORD MARLEY (Chairman of the Colour and Lighting in Industry Committee), who remarked that the Society was a body that had grown rapidly to national and indeed to international importance, although it was not yet quite 40 years old. The Society included amongst its 2,000 members scientists of every type and a nomenclature of its own. Yet its organisation was not only scientific. It was also cultural and aimed at spreading abroad knowledge of lighting and its effects and the development of "good" lighting.

He wished to underline the economic and social importance of good lighting

in the modern world. There was still widespread misunderstanding of the value of lighting. He recalled that it was not until ten years ago that lighting requirements came to be embodied in the Factory Act. During the war, when the importance of light became better realised owing to the blackout, industrial lighting was further specified in the "Factories (Standards of Lighting) Regulation Act" of 1941. The standards imposed by Parliament were, however, only minimum standards and it became the duty of the illuminating engineer to see that these were more than fulfilled and that there should be not only the right amount of light but the right kind of light and in the right place. In this connection Lord Marley also emphasised the importance of surroundings and quoted an instance of a factory where owing to the general use of a great deal of expanded metal work painted with silver paint the effect was glaring to a degree.

Lord Marley next touched on the part played by the Society and its members during the war, for example, in promoting good lighting in factories which played such an important part in national production, and in relation to the health of the workers. The Society had also made a great contribution to the safety of people during the blackout.

Subsequently, he referred to the interest of the Parliamentary and Scientific Committee, of which he was Vice-Chairman, in the development of scientific aid, optical instruments, and to the work of the Colour and Lighting in Industry Committee, of which he was Chairman and on which the I.E.S. was represented by Mr. H. C. Weston and Dr. Nelson. The importance of colour had been emphasised in a number of reports of working parties—amongst which that of the Wool Industry Working Party was of special interest. Dr. Marley also advised members of the Society to inspect the lighting of the new premises of the British Colour Council and the display of colour and lighting at the Colour Hall, in the present British Industries Fair. "The marriage of light and colour, properly used, is brightening our factories, saving fuel, and helping the national drive for great production, and making our working people happier." In this connection the Society

could give substantial aid. He recalled that as long ago as 1941 the Select Committee on national expenditure had pointed out that the cost of installing improved lighting in a factory might be far outweighed by resultant increases in output. This suggested the motto "*Ex Luce Lucellum*" which might be rendered, "From light we may very well get a little profit."

Coupling with the toast the name of the President (Mr. J. S. Dow) Lord Marley recalled that Mr. Dow had been with the Society since its foundation nearly 40 years ago and had never missed a single meeting of the Council during this period. He had been a member of many Government and other committees on factory lighting and illumination research.

THE PRESIDENT (Mr. J. S. Dow), responding, said that Lord Marley had spoken very kindly of the efforts of the Society and had emphasised especially the vital importance of good lighting in industry. So it was in every walk of life. By reducing essential illumination some apparent economy might be made, but it was always necessary to pay the price—sometimes a heavy one.

All would sympathise with those in high places, faced by difficult problems that seemed to change almost from hour to hour. Ministers, like men, were the victims of fate. Yet one could wish that they were less ready to yield to impressions which science did not endorse and the senses denied—for example, that we could readily endure the rigours of an English summer without artificial heat and could carry on during periods of capricious daylight without artificial light! (Laughter.) It was strange that such a position should arise at a moment when artificial light—almost alone among commodities—was cheaper and more readily available than at any time in our history.

Continuing, the President said that we were now passing through a period of enforced economy, a period of deprivation and regimentation rather than reconstruction. He recalled that one of the first acts of the Ministry of Transport, when it assumed responsibility for public lighting, was to urge the extinction of all street lamps after midnight, a procedure which



From left to right:—Mr. H. C. Weston (*Hon. Secretary*), Mrs. Weston, The Rt. Hon. Lord Marley, Lady Marley, Miss M. M. Dow, Mr. J. D. Dow (*President*).

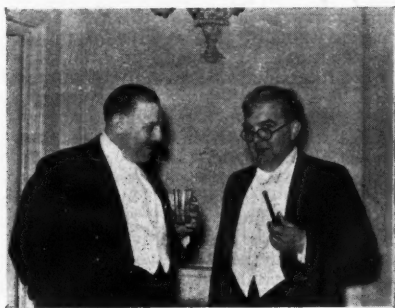
would certainly tend towards the "uniformity" on which so much stress had been laid but not quite in the manner for which they had hoped. It had also seemed ironical for committee meetings concerned with the planning of adequate and even liberal office lighting in the future, to be asked to conduct their business by the light of a couple of wax candles!

This, it was to be hoped, was only a passing phase. When they had once more complete freedom to instal the lighting they desired,

he hoped that lighting engineers would do as Lord Marley had advocated, introducing a little colour into industrial lighting. In time to come, more attention might well be given to the problem of securing lighting that was pleasing as well as efficient. In this connection, the President recalled a warning addressed to the lighting industry by Sir Clifford Paterson many years ago, not to earn the reproach "Light had they but no Insight, Illumination but no Vision." Let them, therefore, when possible, impart a touch of fancy to lighting, a little bit



The President greeting Dr. and Mrs. Halbertsma.



Dr. Charles Hill (*right*) in conversation with Mr. K. R. Mackley (*left*).

of what our friends across the Atlantic had termed "Imagineering."

In the concluding portion of his address the President again thanked Lord Marley for his references to the Society and to the services which it had rendered. The Society owed much to the generous support of its members and had never suffered from the difficulty which some foresaw when the Society was formed, that the various interests could not be induced to work harmoniously together.

After telling an amusing story of a negro preacher who defined his congregation as 100 per cent. active (50 per cent. for him, 50 per cent. against him), the President said that the I.E.S. was 100 per cent. active, but the members all pulled in the same direction and were sustained by a common purpose.

He did not mean that they all spoke with identical voices or echoed the same thoughts in identical words, but rather that the Society achieved a synthesis, embodying in their conclusions any different outlooks. This was the democratic basis of decision as compared with the uniform and machine-made utterances of a totalitarian regime; or, to adopt another analogy, it was harmony as compared with unison, with which alone musical composition would not go very far.

The President quoted a remark due, he believed, to Mr. Priestley, that the history of the terrible years through which the world had passed might have been very different if people had been less inclined to say "Oh, Yeah?" and more disposed to say "Yes!" The aim and inclination of the Society, when approached with any constructive proposal or request for help was to say "Yes!" and he thought that its record proved its readiness to respond in that way. Those interested in the study of illumination were fortified by the conviction that they were in a position to make a real contribution to the comfort and happiness of the world. In this age of disillusion people were only too prone to ask, "What's the use?" No one in the Society was likely to ask this question. They all knew that whatever their task might be, whether they were among the gifted and privileged few who helped in the birth of great inventions, or were engaged in planning lighting installations, in the photometric laboratory, in maintaining the lighting of the King's high-

way, or even in the humble service of handing lamps and fittings over the counter, they were all doing indispensable service which no one could challenge and about the value of which no shadow of doubt could exist.

### "The Guests"

Mr. J. G. HOLMES, in proposing the toast of "The Guests," thanked Lord Marley, a very busy man, for his kindness in accepting the Society's invitation to be present and for the interest which he had shown in its work. The Society was interested in the production of light, its distribution and its reception. The art of putting light in the right place, to which Lord Marley had referred, rested with the personal skill and understanding of the illuminating engineer, but the reception of light, after his task was done, was a subjective and individual matter. With its wide range of interests the Society needed the advice and guidance of a wide circle of friends, and it was very fortunate in this respect.

Mr. Holmes then referred by name to a number of distinguished guests present, concerned respectively with scientific aspects and with the practical application of light. A special reference was also made to Dr. Halbertsma, the President of the International Illumination Commission, who had addressed them on the previous day, and to Dr. Walsh who on this occasion was present as the chairman of the National Illumination Committee, but who would next year be the host.

Proceeding, Mr. Holmes said that light was an intensely personal thing. It was not enough to control levels of illumination by Act of Parliament; we now thought of light to an increasing extent as something which contributed to our comfort, our health, our efficiency, and our joy in life. More regard was now being paid to the sense of satisfaction that lighting could give, and in this connection he named other guests who were intimately interested in the reception of light and in personal and psychological aspects of illumination. The toast was associated with the name of Dr. Hill Charles, secretary of the British Medical Association.

DR. CHARLES HILL, responding in a humorous and fanciful strain, quoted at length from the poets and showed in-

genuity in tracing lines in which some reference to light occurred. Of such were "A little warmth, a little light of love's bestowing, and so good night," and Milton's lines on "storied windows richly dight, casting a dim religious light." One other quotation which Dr. Hill remarked was not unrelated to the excellent meal that had been provided was "I eat my peas with honey, I've done so all my life, It makes the peas taste funny, But it keeps them on the knife!"\*

There were present approximately 250 members and guests, no doubt a good attendance in present circumstances. Amongst those who were seated at the High Table may be mentioned Dr. H. Buckley (Past President) and Mrs. Buckley, Mr. W. N. C. Clinch (President A.P.L.E.) and Mrs.

\* We leave to readers the exacting task of tracing this reference.—Ed.

Clinch, Mr. V. W. Dale (secretary, Br. Elec. Development Association) and Mrs. Dale, Sir Stewart Duke-Elder and Lady Duke-Elder, Mr. V. Z. de Ferranti (President I.E.E.) and Mrs. Ferranti, Mr. Percy Good (Director, British Standards Institution) and Mrs. Good, Dr. N. A. Halbertsma (President I.C.I.) and Mrs. Halbertsma, Miss Caroline Haslett (Director, Elec. Association for Women), Dr. Charles Hill (Secretary British Medical Association) and Mrs. Hill, Mr. W. J. Jones (Past President) and Mrs. Jones, Dr. F. M. Lea (Director, Building Research Station) and Mrs. Lea, the Rt. Hon. Lord Marley (Chairman, The Colour and Lighting in Industry Council) and Lady Marley, Mr. A. W. Oxbrow (President, British Optical Association), Sir Clifford Paterson (Past President) and Lady Paterson, Mr. C. G. Stillman (Vice-President, Royal Institute of British Architects) and Mrs. Stillman, and Dr. J. W. T. Walsh (Chairman, N.I.C.).

## A New Signalling Lamp for the Merchant Navy

Signalling lamps carried on British merchant ships will in future be electric daylight lamps, with not less than 60,000 candle power, giving a range of five miles on a normal bright day in home waters.

These lamps will replace oil lamps, after a date to be fixed, as the approved type to be carried by ships of over 150 gross tons making international voyages. The oil lamps at present carried are based on a specification introduced during the 1914-1918 war. They are of little use for daylight signalling, and they cannot be sighted on their object. A sighting device is to be incorporated in the new lamp so that the beam can be directed on to the receiving station. These daylight lamps will be similar to the lamp developed by the Royal Navy and used extensively during the last war by the Merchant Navy.

Manufacturers wishing to produce this signalling lamp will be required to meet the conditions of the specification which has been approved by the Minister of Transport, and will also be required to submit specimen lamps to

the National Physical Laboratory for testing. For satisfactory lamps certificates of approval will be issued by the Ministry of Transport, and the accepted lamps will be placed on the approved list.

The specification, full details of which are obtainable from the Ministry of Transport, requires an axial c.p. of not less than 60,000 and a horizontal and vertical divergence of not more than 3 degrees. The entire apparatus is not to weigh more than 38 lb. Two spare electric bulbs shall be carried. An easily removable shade to reduce axial c.p. to between 8 and 15 is to be furnished. Other conditions refer to sighting arrangement, method of signalling, nature of key or trigger, capacity of battery, and contacts therewith, etc.

**ERRATUM.**—We are requested to draw attention to an arithmetical error which occurred in the article entitled "Industrial Problems of Natural Lighting," contributed by Mr. P. J. Waldram to our last issue (May, 1947, p. 85). The estimated official expenditure for new schools should have been £1,030,000,000 (not £1,030,000)—a very substantial increase which serves to strengthen the author's argument!—Ed.

# Lighting for Drawing Offices

By L. C. RETTIG

(Summary of a paper given before the I.E.S. Bath and Bristol Centre)

## Introduction

This paper is intended to be a review of current practice in the illumination of drawing offices. Reference is made to the several tasks coming under this broad classification, and typical examples of various methods of illumination are examined.

It is impossible to enumerate each of the large number of trades and professions to whom the drawing office is an essential unit and where overall efficiency largely depends upon the activities of this department, but the consideration given to obtaining the best possible lighting in recent years has been sufficient indication of its importance.

There are several quite different visual tasks coming within the field under review, varying widely in respect of the visual effort required and consequently demanding specialised treatment in each case, or, as in many installations, necessitating due consideration of their requirements within the framework of a general installation.

The recommended values of illumination given in the I.E.S. Code are considered to be correct in a general sense but it is suggested that they should be expanded as follows:—

Table I

Drawing Offices	L/sq. ft.	Grade
Boards .....	30	2A
Boards, Tracing .....	70	2B
General .....	10	5B
Photo Printing and Processing .....	15	4B
Mould Lofting		
Heavy Engineering ....	12	5B
Aircraft .....	70	2B
Process Printing .....	30	3B

## Drawing Offices

When examining the various methods of illumination by tungsten lamps adopted in recent years, it is apparent that the most successful have been those whose objective has been the creation of the largest possible light source with the lowest possible brightness, as opposed to those employing general plus local lighting or localised general schemes.

Whilst it must be admitted that in the latter two categories most installations provide sufficient illumination in a quantitative sense, glare is usually present in the lowest degree, particularly when flexibly mounted local lighting supplements general illumination. Not only may direct glare be caused by the angle of the small shades, but excessive brightness contrasts are created by the draughtsman's tendency to use these lamps in close proximity to white paper on boards in the vertical or nearly vertical plane. The employment of the modern drawing board or draughting table with adjustable mounting also removes any effectiveness which may have been claimed for unidirectional schemes employing angle reflectors with diffusing visors, and materially reduces the value of those based on the location of a dominant light source at the top left hand corner of each board. These systems are also subject to criticism on the obvious grounds that they are quite unsuitable for the somewhat surprising number of left handed draughtsmen employed.

All such schemes represent a laudable effort on the part of the designers to eliminate shadows from the working edges of tee and set squares, but since left handedness, rearrangement of boards and variable mounting must be allowed for, it is suggested that the solution lies in the direction of perfectly diffused general lighting.

The degree of perfection obtainable is, in most cases, governed by economic considerations. It is, for instance, easy to recommend, if the building is suitable, the installation of indirect lighting, knowing that the results will give ideal conditions. Few undertakings, however, will face up to the high ratio of watts/lumens per sq. ft. which must be employed, quite apart from the high

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Fig. I

annual cost of maintaining the reflecting surfaces in first-class order.

Placing indirect lighting in the luxury class, except under special circumstances which are outside the scope of this paper, we are faced with but few alternative methods.

With tungsten lamps in order to minimise shadow it is inevitable that the source must be equipped with a suitable diffusing medium. In ideal conditions this may take the form of complete lay-lighting or ceiling panels illuminated from above and glazed with glass or plastic screens. When these methods are adopted it is perhaps as well to remember certain guiding principles applicable elsewhere:—(a) the brightness of the light source should not greatly exceed 4 candles per square inch, (b) when panels are used they should be equipped with short return side panels in order to avoid undesirable brightness contrasts on the ceiling (tunnel effect), and (c) panels should occupy not less than 10 per cent. of the total ceiling area and are most effective in elongated form.

Many highly successful installations employing standard industrial diffusing units have been seen in recent years. From observation of the results in each case various facts have emerged. Firstly, it has been established that the spacing ratio should not exceed .75—1. Secondly, and contrary to some firmly held opinions, the minimum mounting heights specified for open reflectors for various wattages must be adhered to, and can with advantage be increased. It is not generally realised that except in small rooms the coefficient of utilisation is only slightly reduced by increasing

mounting height, and that by so doing the greater number of units contributing to the lighting of any given point progressively weaken shadows and amply compensate for the slightly higher load.

At the present time we can also review the application of tubular fluorescent sources to this class of work. It cannot be denied that in this sphere in particular the advent of a lamp of large surface area and low brightness presented a ready made solution to a number of problems. This was particularly so in the case of small rooms where such lamps could be applied as local, localised general or general lighting with reasonable success. Ideal conditions, however, still call for general lighting wherever possible, since the visual task with its physical variants remains the same.

Initially it might be assumed that there would be no variation between tungsten and fluorescent practice, but experience has shown that fluorescent lamps in symmetrically placed layouts do not provide the same degree of diffusion as the same number of lamps arranged in lines or in the form of continuous troughing. It is also necessary to point out that these lines should run transversely to the normal direction of the worker's vision in order to avoid, as far as possible, any shadow from the draughtsman's body falling on horizontal boards whilst at the same time providing maximum diffusion on the right or left edges of set squares. It is becoming increasingly obvious that fluorescent lamps in this type of location should be used in reflectors with a cut-off 70 deg. above the vertical on the short axis. With large installations in particular, an effect of what might be described as "mass glare" has been observed when this angle has been increased. In this connection, also, the practice of installing open batten type fixings should be avoided except in small rooms where the source is more than 20 deg. above the observers horizontal line of vision.

### Tracing

Very little imagination is needed to realise that this task cannot be classified with general drawing offices. The degree of accuracy required is usually the same as for the original, but in this case a diffusing medium is imposed between the work and the eyes whilst the frequent necessity for retracing from



Fig. 1. A recent installation using tungsten filament lamps.

indistinct blue or dye-line prints still further reduces the apparent contrast. Further justification for a value of 70 L/sq.ft., as set out in Table I, is the considerable absorption of light by the double passage through the tracing paper or cloth. This has been tested on a number of samples of commercial grade and found to be as high as 33½ per cent. for a single thickness.

The same factors governing diffusion apply as in ordinary drawing offices and consideration must also be given to specular reflection from the sometimes highly polished tracing papers or cloths, necessitating the careful placing of the working position with reference to the light sources, or alternatively employing light sources of very low surface brightness.

### Mould Lofts

The special requirements of this type of building form an interesting study and may be regarded as an off-shoot of normal drawing office work.

From the earliest times, when man proposed to build a boat and probably scratched an outline in the nearest patch of sand, it has been necessary to provide some form of full-scale working drawing in order to secure accurate alignment of the individual parts of the final product. Under the names of "Mould Loft," "Lofting Department," or "Template Shop" this method is used by the shipbuilding, structural and heavy engineering, and latterly aircraft industries.

With the exception of aircraft, the system is, broadly speaking, the same. A dimensioned small-scale drawing is received from the designers. The outline

or shape and other details are drawn to full scale on the floor of the mould loft (which is usually painted matt black), using fine chalk, or sometimes pencil, with chalk location marks for holes, etc., to be drilled. From these marks a template of wood or metal is prepared, this being used in the shops for final production.

It will be realised that errors in these departments may mean very costly rectification and that good lighting is essential. Not only must this be adequate in quantity, in order to illuminate the sometimes poor contrast of the marks against the dark surface, but also the degree of diffusion must be fairly high by reason of the shadows consequent upon the crouching position of the operator's body. In approaching the problem of suitable lighting consideration must also be given to the probability that the available mounting height will seldom be great, in many cases being little more than head room.

To provide a basis for classification the actual task and the templates used were checked in a wide variety of shops, and it was found that tolerances of + or - .0625 in. were common and seldom lower than .04 in., indicating that the I.E.S. Code classification 5B can be applied, utilising the mean value of 12 L/sq.ft.

Since the task may be regarded as a form of drawing office work, and as there is no alternative to general lighting, the foregoing paragraphs on installations and diffusion also apply here, but all calculations must be based on a floor level working plane, from which spacing ratios of not less than 1 : 1 should be allowed for reflector type installations.

It might be added that many successful installations employ mercury or sodium lamps as an alternative to tungsten, the monochromatic light being quite suitable, especially when it is realised how few people per unit area are actually employed in such buildings. Here again, however, fluorescent lamps will undoubtedly supersede other types by virtue of the much greater diffusion obtainable.

### Aircraft Application

The tendency of increasing size in aircraft, plus the need for extreme accuracy



Fig. 2. Typical mould loft.

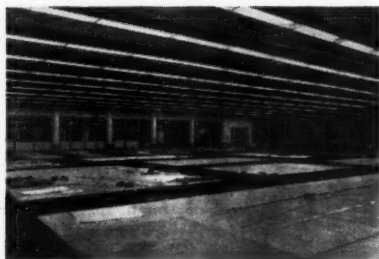


Fig. 3. Installation using twin fluorescent tubes in continuous troughs.

in the aircraft industry, has led to the adoption of improved methods of lofting which will in all probability be taken up by other and older industries when the benefits are more widely known.

As opposed to the tolerances pertaining to the previously mentioned shops, those in connection with airframe manufacture are as low as  $\pm$  or  $- .005$  in. As these must be seen with the naked eye it is patent that the problem is more complex.

The actual drawing is carried out on horizontal tables of normal height, which may be assembled to form an area or "floor" for the full-scale drawing of sections running up to 80 ft. in length. This assemblage introduces the same problems of body obstruction as before, but coupled with the fineness of the work, the strain of the visual task is accentuated by a lithographic process of reproduction utilising etched aluminium sheets as a base, as an alternative to white painted metal sheets otherwise employed. Very little imagination is needed to visualise the low degree of contrast between a .01 in. pencil line,

later to be inked, and the matt grey of the etched finish.

Early experimental lighting with tungsten sources for this work proved unsatisfactory. Later work with fluorescent lamps established the fact that the minimum illumination that could be employed was 50 L/sq.ft., which must obtain under the worker's body when crouched on the drawing. It has been found that a value of 70 L/sq.ft. compensates for the losses which may be expected from this cause.

One such installation with which the author was concerned is now in service. With the specific object of obtaining a complete "ceiling" of light, twin tube continuous troughs were employed, single tube types being regarded as impracticable by reason of the obstruction of daylight from the "north light" roof. A mounting height some 10 ft. above the working plane was decided upon as being reasonable on economic grounds in a room 80 ft. square, whilst at the same time giving maximum diffusion with troughs having a  $70^\circ$  cut-off across the shorter axis.

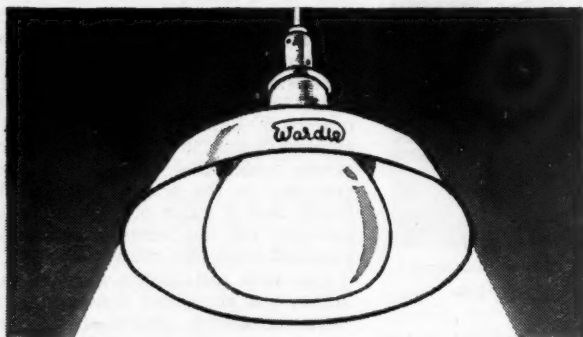
Whereas in shipping and similar lofts the use of sources of low surface brightness may only be necessary by reason of subnormal mounting heights, in the high level aircraft type they are essential in order that specular reflection from highly polished rules and instruments may be avoided.

Ancillary to the main lofting shops there are usually process rooms for printing and photography. It is unnecessary to describe these in detail as the requirements are met by standard practice, although the illumination values should be somewhat higher than usual in order to avoid undue contrast with the main area.

## Cuts In Public Lighting

Reviewing possible economies in fuel through cuts in lighting, etc., the *Evening Standard* recently pointed out the limited savings in consumption of electricity to be made in the domestic field and public lighting. The extent to

which domestic restriction will be necessary next winter, it is remarked, remains open to doubt. But in regard to street lighting "... this at least is beyond question. The cuts in street lighting which have caused many road accidents and provided a direct encouragement to crime are totally unjustified and should be rescinded."



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### Floodlighting of a Shipbuilding Berth

Shipbuilding is one industry which is very dependent on the use of artificial light. Work on the construction of the hull of a vessel is liable to be greatly impeded during dark winter hours, and an efficient system of floodlighting, enabling work to proceed continuously by day and night, is a great asset. The illustration shows the effect of an installation designed by Metrovick lighting engineers for Messrs. William Doxford and Sons, Ltd., of Sunderland. The first berth being lighted is 88 ft. wide, tapering from 90 ft. to 110 ft. in height at the riverside and is capable of taking a hull up to 550 ft. in length.

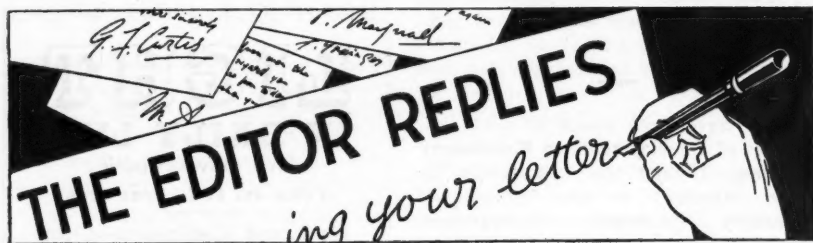
An illumination of 1.2 lumens per sq. ft. is possible at keel level, and as the hull develops this increases to 3.7 L./sq. ft. at 20 ft. and a maximum of 6.5 L./sq. ft. at deck level. The illumination is provided by means of totally enclosed floodlight projectors and parabolic

angle reflectors housing high wattage general service lamps. The lighting load is 22.5 kW.

In view of the success of this installation Messrs. Doxford and Sons have decided to equip other berths in a similar manner.



A shipbuilding berth, effectively floodlighted, enabling work to proceed by day and by night.



I have been asked to quote evidence on the **Effect of Age on Eyesight** and the corresponding **Increased Illumination Required**. It is common knowledge, of course, that in later years eyesight *does* deteriorate. This effect is believed to be most pronounced in the case of occupations imposing much close work on the eyes, such as those of workers concerned with printing, book-keeping, and the garment making industry.

I cannot give precise figures in regard to the increase in illumination to compensate for poor vision. Mr. H. C. Weston, however, has been carrying out some researches in this field, and his data will doubtless become available in the near future. It is a common experience of old or middle-aged people that a substantial increase in illumination makes much more difference to them than to others with better vision—or themselves in the days of their youth. It should not be assumed, however, that illumination, however high or however good, can completely restore the balance. In certain processes (hosiery linking for example) it has been shown that highly magnifying glasses are much more potent in this respect.

I have received from Mr. J. B. Todd a letter commenting at some length on Mr. Minchin's recent note entitled "**What Is Visibility?**" (April, 1947, p. 67). Readers of detective tales will

be well aware how many different inferences may be drawn from a published statement of facts, and how apparent inconsistencies can be explained when the full circumstances are known. This is well exemplified in some subsequent comments of Mr. Minchin on the points raised. He points out that the chief object of his efforts was to show the nature of the technical points which should be taken into consideration in assessing the degree of carelessness involved. (Fortunately technicians are not faced by the almost insuperable problem of having to decide at what point "carelessness" becomes "gross carelessness"!)

In this age of mass production one is always interested to hear of **individual craftsmanship**. My attention has been drawn to a cutting referring to the work of Mr. William Margolis, an I.E.S. member, who combines training as an engineer with a taste for wood carving, which he took up during the war.

The little lamp standards illustrated all bore evidence of original design—some perhaps giving an impression of oddity, but all arresting attention and illustrating the designer's aim to get away from the old "pole and hole" conception of a fitting. Mr. Margolis has also prepared a model of a Charles II. period street. A collection

of similar models illustrating styles and methods of the past might be of considerable interest.

As I have been asked to quote instances of **Developments in Fluorescent Lighting**, I take the opportunity to draw attention to the lighting at **Piccadilly (London) Underground station**, which has been extended. In a way the application of the new system to both adjacent platforms depreciates the installation from a show standpoint as it removes the opportunity of comparing the new and the old. There can, however, be no doubt of the improvement. Of special interest is the extension of fluorescent lighting to the escalator. Here again the great improvement is striking, and although all the lamps are simultaneously in view of those descending the stairway the effect is not objectionable, largely because they are seen against the white background of the overhead ceiling.

One point that must have struck anyone examining these installations is the very brilliant manner in which the **colours and general appearance of pictorial advertisements are enhanced**. One is tempted to infer that there should surely be some corresponding advance in advertising rates!

Two new Reflector-Units for **Fluorescent Lamps**, introduced by Benjamin Electric, Ltd., Fluolier "A" and "B," deserve notice. The former is a vitreous enamelled reflector characterised by ease of erection and accessibility of parts, the latter a trough accommodating two 40W. 48 in. lamps, and marking a distinct advance in design. The twin lamp circuit obviates flicker and gives a power factor of approximately unity, and there are other neat features.

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BY J. STEWART DOW

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## Light and Lighting

At the commencement of the present year reference was made to prospective editorial changes in connection with *LIGHT AND LIGHTING*\* and to various improvements in contents and make-up which we have in mind for the future.

These possibilities have not been forgotten. It is evident, however, that so long as the present restrictions in the supply of paper and difficulties in regard to printing continue any serious effort to enlarge the journal and increase its circulation is rendered almost futile. We should, in fact, be wasting powder and shot in attempting any major changes at the present moment.

This is not to imply that all immediate improvement is impossible. We shall welcome constructive suggestions, and we take the opportunity of referring to one or two points that have been brought to our notice.

First, it has been suggested that more reference might be made to local activities of I.E.S. members in the form of personal notes. We will gladly try to make room for such data—but it is up to secretaries of centres and other I.E.S. members to furnish such information.

Secondly, it has been urged that more might be said about developments in the lighting field—new fittings, new gadgets and installations. Here, again, we shall welcome information. It does not seem, however, from what manufacturers tell us, that there is as yet much that is really novel to be recorded in this respect. We try to give publicity to such notes as do reach us, and we do not see in other (weekly) journals many references to genuine novelties. Before very long, when the wheels of industry are revolving more smoothly, things may be very much better in this respect. In the meantime, we welcome interesting data; let readers or firms in the lighting

industry send us all the information they can.

Finally, we should like to point out one fact that many I.E.S. members do not seem to realise—the very reasonable terms on which they receive *LIGHT AND LIGHTING*.

For many years, in spite of the growth in membership (from 800 to over 2,000 since the outbreak of war), and the progressive increase in the costs of production they have received it virtually for nothing.

Inspection of the published accounts of the society for the year 1946† shows that the net amount paid to the journal was only £231, which worked out at only 2s. per annum for each member, as compared with 10s. 6d. to independent subscribers (a figure which, incidentally, will of necessity be increased substantially in the near future).

Further analysis shows that as 12 copies of *LIGHT AND LIGHTING* are issued during the year the cost per copy to I.E.S. members is exactly 2d. As the postage (borne by the journal) of *LIGHT AND LIGHTING* and the I.E.S. "Transactions" (issued together) is 1½d., it will be seen that the net return is of the order of one halfpenny per copy. Members, therefore, can scarcely complain of not getting "value for money."

† Trans. Illum. Engg. Soc. (London), No. 3, 1947, p. 64.

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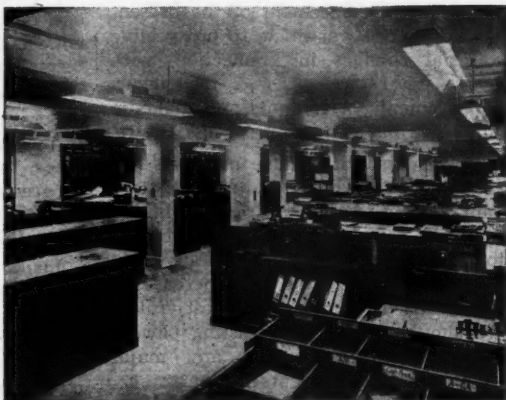
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\* *LIGHT AND LIGHTING*, Jan., 1947, p. 2.

## Fluorescent Lighting at the Royal Mail House

The picture shows a section of the offices of the Royal Mail House, Leadenhall-street, London Lines, Ltd., where warm white fluorescent 80-W. lamps have recently been installed. In view of the presence of cased beams on ceilings a uniform mounting height of 8 ft. was selected. Open trough fittings are sprayed cream externally. Besides open type units decorative fittings glazed with opal "Perspex" are used and 15 lumens per sq. ft. are provided. The scheme was prepared by the illuminating engineering department of Siemens Electric Lamps and Supplies, Ltd.



## Plastics for Public Lighting

The vulnerable nature of street lighting fittings composed of glass, when exposed to the stone-throwing activities of small boys and others who should know better, has recently been the subject of comment in this journal.

It is interesting, therefore, to note the suggestion in a recent article in the "Electrical Review," by F. H. Pulvermacher,\* that more use should be made of plastic materials, such as "Perspex" and "catalin," for street lighting equipment.

Such materials have certain definite advantages. Besides being less liable to fracture than glass they are considerably lighter (the specific gravity of Perspex is only 1.19 as compared with 2.5 to 5.0 for glass) and although they are not so hard it appears that the resistance to scratching is considerable and that any scratches do not tend to scatter light so that they have not much effect on the performance of more or less diffusing surfaces. In the case of Perspex it is claimed that finer optical system can be adopted, with a considerable reduction in the mass of material.

One of the chief points for considera-

tion is the effect on plastics of temperature. Lanterns should be dust-tight and this would involve some departure from existing designs.

As an instance of the use of plastic material in street lighting units the new fluorescent lighting fittings produced by the British Thomson Houston Co., Ltd., which have been installed in Old Bond-street (London), and in High-street, Rugby, are mentioned.

## Fluorescent Lighting

We understand from Mr. N. Hunter, the general manager and engineer to the borough of Stockton-on-Tees, that the Stockton Town Council has decided to make a trial installation of fluorescent street lighting. Six fittings to be supplied by the B.T.H. Co., Ltd., are being installed in the Sorton-road-Bishopton-lane area.

With reference to our recent account of the installation of fluorescent lighting in St. Paul's Church, Haringay, Messrs. Linelux, Ltd., inform us that the fittings adopted for this purpose were from their standard range, the only alterations necessary being in the method of fixing, owing to the unusual heights of suspension.

\*"Elec. Review," June 13, p. 991.

